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Application No. 10/645,333
Filed: August 21, 2003
TC Art Unit: 1742
Confirmation No.: 7603

REMARKS

Claim 1 is currently amended. Claim 2 is as originally presented and claim 3 remains as previously presented. Claims 4-8 remain withdrawn from consideration by Examiner owing to previous election. Therefore, Claims 1-3 are pending.

Claim 1 has been amended herein by the insertion of "sheet shaped" in the step of compressing by hot press a resultant mixed material to form a sheet-shaped solid material; this is supported by lines 33-34, page 3 of the present specification. Claim 1 is further amended by insertion of "by using an injection machine," which directly supported by original claim 2. Amended claim 1 is distinguished from the cited references.

Claim Rejections Under 35 USC 103(a)

The Examiner has rejected claims 1-3 under 35 USC 103(a) as being unpatentable over Kato et al. in view of Prater et al. and Tennent et al. It is noted that this rejection repeats the prior rejection without comment on the prior amendment and extensive distinguishing arguments. Accordingly, it is felt the finality is premature and Applicant has been denied appropriate prosecution opportunities not knowing where the Examiner really stands in

BEST AVAILABLE COPY

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relation to the prior response. The Applicant traverses the rejection for the following reasons.

Applicant's method disclosed in claim 1 as amended comprises the following steps:

- (a) mixing a carbon nano material with a metal material in a powder state;
- (b) compressing a resultant mixed material to a sheet shaped solid material by a hot press; and
- (c) forming said sheet-shaped solid mixed material to granules, such as chips, pellets, and the like.

Then the composite metal product is obtained from said granules by the following steps.

- (d) melting the metal in the granules and kneading the metal and carbon nano material to form a composite material by using an injection machine;
- (e) injecting the composite material into a mold to form the composite metal product by using an injection machine; and
- (f) obtaining the composite metal product.

The effect of the present invention is recited precisely on page 2, line 25 to page 3, line 7 of the present specification.

Kato et al. discloses a process comprising the steps of melting a metal material, injecting said melted material into a

Application No. 10/645,333

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TC Art Unit: 1742

Confirmation No.: 7603

BEST AVAILABLE COPY

mold to form a product and obtaining the product. Kato et al. discloses that metallic feed is composed of particles in the form of grains or columns or in the forms of shavings. However, Kato et al. does not disclose a method that includes the above steps (a), (b) and (c) for producing a solid granulated material containing a carbon nano material and a metal material. Further, Kato et al. does not disclose a composite metal product containing the carbon nano material and the metal material from said solid granulated material. As Examiner admits, "Kato et al. does not disclose wherein the metal includes nano-dispersion strengthened metal materials." Neither, in fact, does Kato et al. make any mention of metal composites including carbon.

The Examiner states that Prater et al. teaches to add carbon to metal matrix material to form carbon-reinforced metal matrix composite (col. 5, line 23). Examiner then takes the position that Prater et al. teaches that the carbon nano material is added to the metals (referencing col. 6, lines 1-16). Applicant respectfully disagrees. First, Prater et al. only discloses "carbon fiber" as a reinforcement material (e.g., column 5, lines 36-37; column 7, line 51); Prater et al. does not recite "carbon nano material." Examiner admits that Prater et al. is silent as to the particle size of the carbon fiber. As discussed in more

BEST AVAILABLE COPY

Application No. 10/645,333

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Confirmation No.: 7603

detail below, "carbon nano material" is not the same as "carbon fiber". Therefore, the Prater et al. disclosure of mixing powder, hot-pressing and extruding into "billets" to be then cut as "slugs" (column 6, lines 2-3) could extend only as far as mixing *carbon-fiber* powder, but would not teach making such a mixture of *carbon nano material* and metal material. Therefore, Prater et al. does not disclose a step of forming a compressed, sheet-shaped, solid mixed material containing carbon nano material to form granules such as chips, pellets, and the like. Thus, by reason of not teaching use of carbon nano material, Prater et al. does not teach the steps of (a), (b) and (c) of the present invention. For the same reason, Prater et al. does not teach the steps of (d), (e) and (f) above. Further, with reference to step (d), Prater et al. does not teach "kneading the metal and carbon nano materials to form a composite material and injecting the composite material into a mold to form the composite metal product by using an injection machine" (see Applicant's claim 1); rather, the partially remelted slugs in the teaching of Prater et al. are injected with no mention of further mixing, grinding, or the like (Fig. 8; column 6, lines 37-58).

The Examiner states that Tennent et al. teaches that carbon fibers in the nano particle size scale are used for metal matrix

BEST AVAILABLE COPY

Application No. 10/645,333
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reinforcement material, such that it would be obvious to modify the invention of Kato et al. by the teachings of Prater et al. and Tennent et al. in order to form a reinforced metal matrix with "carbon nano fibers". Applicant respectfully argues that here the Examiner has made a crucial error in understanding and applying the disclosure and teaching of Tennent et al.

Tennent et al. discloses fabrication of nano-scale carbon "fibrils" and further explicitly distinguishes "carbon fibrils" from "carbon fibers". At column 1, lines 53-56, Tennent et al. states, "There is a practical lower limit of fiber diameter, i.e., 6 to 8 micrometers, below which fiber breakage in spinning and posttreatments becomes excessive." The "carbon fibril" disclosed by Tennent et al. is "characterized by a substantially constant diameter between about 3.5 and about 70 nanometers, [...] length [...] less than about 100 times the diameter, [...]". Thus, Tennent et al. discloses carbon fibrils that are distinctly and substantially smaller in diameter than "carbon fibers." For further evidence that Tennent et al. teaches nano-scale "carbon fibrils" to be different from "carbon fibers" Examiner is referred to column 18, lines 58-60: "[...] comprising a carbon fiber and a plurality of carbon fibrils, wherein said fibrils adhere to the outer surface of the fiber." Therefore, it is inappropriate to

BEST AVAILABLE COPY

Application No. 10/645,333

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Confirmation No.: 7603

combine Tennant et al. with Prater et al., because Prater et al. speaks only of "carbon fiber", and Tennent et al. clearly teaches that nano-scale carbon fibrils are not "carbon fiber."

There is no reference in either Prater et al. or Tennent et al. to support the Examiner's constructed term: "carbon nano fibers".

Tennent et al. further teaches away from Applicant's invention by disclosing that "the carbon fibrils of this invention may be dispersed into the matrix, oriented in the matrix by means of e.g., electrical fields, appropriate shearing action or combing, embedded in the matrix by e.g., impregnation, or injected into the matrix, e.g., by means of spray guns." (column 6, lines 3-7). Tennent et al. makes no suggestion to combine carbon nano material and metal material to form a compressed, sheet-shaped, resultant mixed material to be used as a feedstock for injection molding by using an injection machine. Tennent's technology area is too unrelated to be applied appropriately in the context of composite product fabrication methods as disclosed by Prater et al. or by Kato et al.

By virtue of the above arguments, Tennent et al. does not teach the steps of (a), (b) and (c) of the present invention. Further, Tennent et al. clearly does not teach the steps of (d),

BEST AVAILABLE COPY

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(e) or (f). Because Tennent et al. disclose forming metal composites containing carbon nano-scale fibrils, which are different from "carbon fibers", it is therefore not appropriate to combine teaching of Tennent et al. with Prater et al.

Applicant's invention, at each and every step, pertains to and involves carbon nano material. Prater et al. do not disclose any methods that pertain to carbon nano materials, therefore Prater et al. do not teach any of the steps of Applicant's invention. Kato et al. do not disclose any methods that pertain to carbon at all, therefore Kato et al. do not teach any of the steps of Applicant's invention.

All of the cited references, Kato et al., Prater et al. and Tennent et al., fail to disclose the steps of (a), (b) and (c) of the present invention. And Prater and Tennent further fail to disclose the steps of (d), (e) and (f) of the present invention.

Most importantly, all of the cited references fail to disclose a sheet-shaped solid material compressed by hot press as an intermediate material for forming the granulated material.

SUMMARY

Claims 1-3 are pending. Examiner's rejections have been traversed and the rejections are further overcome by amendments

-11-

BEST AVAILABLE COPY

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herein to Claim 1. Claim 2 is as originally presented and claim 3 remains as previously presented. Kindly calculate the filing fee based on the amended claims. This Response puts the claims into proper form for allowance, which allowance is requested.

The Examiner is encouraged to telephone the undersigned attorney to discuss any matter which would expedite allowance of the present application.

Respectfully submitted,

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